



## INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior  
National Park Service

All or some of the information you provide may become available to the public.

OMB # (1024-0236)  
Exp. Date (11/30/2010)  
Form No. (10-226)

<b>Reporting Year:</b> 2007	<b>Park:</b> Shenandoah NP	<b>Select the type of permit this report addresses:</b> Scientific Study	
<b>Name of principal investigator or responsible official:</b> Thomas Jennings		<b>Office Phone:</b> 804-527-5182	
<b>Mailing address:</b> VA DEQ  Office of Air Quality Monitoring  4949-C Cox Road Glen Allen, VA 23060 United States		<b>Office FAX</b> 804-527-5160 <b>Office Email</b> tfjennings@deq.virginia.gov	
<b>Additional investigators or key field assistants (first name, last name, office phone, office email)</b>			
<b>Name:</b> Brandon Brumfield		<b>Phone:</b> 540-574-5822	<b>Email:</b> bdbrumfield@deq.virginia.gov
<b>Name:</b> Anton Sorkin		<b>Phone:</b> 804-527-5181	<b>Email:</b> avsorkin@deq.virginia.gov
<b>Project Title (maximum 300 characters):</b> Air Pollution Monitoring: TEOM - PM2.5 FRM Comparison			
<b>Park-assigned Study or Activity #:</b> SHEN-00329	<b>Park-assigned Permit #:</b> SHEN-2006-SCI-0013	<b>Permit Start Date:</b> Oct 01, 2006	<b>Permit Expiration Date:</b> Jul 31, 2007
<b>Scientific Study Starting Date:</b> Oct 01, 2006		<b>Estimated Scientific Study Ending Date:</b> Jul 31, 2007	
<b>For either a Scientific Study or a Science Education Activity, the status is:</b>  Completed		<b>For a Scientific Study that is completed, please check each of the following that applies:</b>  <input type="checkbox"/> A final report has been provided to the park or will be provided to the park within the next two years  <input checked="" type="checkbox"/> Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park  <input type="checkbox"/> All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
<b>Activity Type:</b> Monitoring			
<b>Subject/Discipline:</b> Air Pollution Effects			

### Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):

Background / Objective:

In 1997, the U.S. Environmental Protection Agency promulgated new national ambient air quality standards for PM2.5 (particle matter equal to or less than 2.5 microns in aerodynamic diameter). EPA determined that these standards are necessary to protect public health and the environment.

In 2004, the VA DEQ Office of Air Quality Monitoring (AQM) assisted the National Park Service in installing a TEOM Continuous PM2.5 sampler at the Big Meadows air monitoring site in Madison County, Virginia. The TEOM was furnished by VISTAS through

funding arranged by EPA III. Ownership of the TEOM was later assigned to the VA DEQ. The National Park Service is in charge of daily operation, where as the VA DEQ is responsible for reporting the uncorrected particulate data (no seasonal correlations) to the EPA AQS air database. EPA had requested VA DEQ to operate a Federal Reference Method (FRM) PM2.5 monitor at the site for a period of one year as a collocated particulate sampler. The TEOM would collect hourly data everyday. The PM2.5 FRM monitor would collect 24-hour samples everyday for approximately 30 days in the middle of each season (October 2006, January 2007, April 2007, and July 2007).The collocated data would be used to establish seasonal correction factors that will make the TEOM data "FRM-like" and comparable to other TEOM samplers across Virginia currently using seasonal correction factors. After each sampling season, the PM2.5 FRM monitor was returned to AQM for refurbishing and recalibration.

During the study, there were two principle ambient air instrumentation operators:

ĩ § Brandon Brumfield of the Harrisonburg VA DEQ Regional Office was the operator of the PM2.5 24-hour FRM monitor

ĩ § Liz Garcia of the National Park Service was the operator of the TEOM Continuous PM2.5 monitor.

**Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):**

**Accomplishment:**

Throughout the study the PM2.5 FRM monitor was operated under the guidelines such that all sampling, filter handling, and quality assurance procedures was the same as found in the VA DEQ particulate monitoring program. These procedures are outlined in the VA DEQ Quality Assurance Project Plan for the PM2.5 Ambient Air Monitoring Program, November 1, 1998, and EPA's Quality Assurance Guidance Document 2.12, November 1998. Some PM2.5 FRM particulars of the special sampling study are:

- a) each sample would be twenty-four hours (midnight to midnight).
- b) all sample filters would be pre-weighed by personnel at the Virginia Division of Consolidated Laboratory Services (DCLS) and shipped to the designated DEQ Harrisonburg operator; upon sampling, the filters would be collected by the operator and shipped in a cooled container to DCLS for final weighing.
- c) the PM2.5 FRM monitor would be a R&P Model 2025 Sequential PM2.5 Sampler
- d) the Model 2025 sampler would be calibrated and installed by AQM personnel prior to each sampling season; upon the end of each sampling season, the monitor would be removed and returned to AQM for cleaning and testing.
- e) only on days when both the PM2.5 FRM and TEOM (24-hour averages) collected valid daily samples would data pairs be used for statistical analysis.

The PM2.5 FRM sampler was installed at Big Meadows on September 26, 2006, by VA DEQ personnel with Initial sampling began the following day. Seasonal sampling went fairly well except for the Winter 2007 period, when ice storms limited access to the air monitoring site.

Fall 2006 Sept. 27, 2006 to Nov. 6, 2006 35 data pairs

Winter 2007 Jan. 19, 2007 to Feb. 15, 2007 27 data pairs

Spring 2007 Apr. 3, 2007 to May 6, 2007 28 data pairs

Summer 2007 June 29, 2007 to Aug. 1, 2007 26 data pairs

During the first three sampling seasons (Fall, Winter, Spring) the levels of fine particulates were very low. Of these three, the Winter

sampling season was extremely low. During the Summer sampling season in 2007, the fine particulate levels were generally moderate to low.

Hourly PM2.5 TEOM readings were used to generate data sets of 24-hour averages; these in turn were compared with the PM2.5 FRM 24-hour values. Utilizing the data pairs generated during each of the sampling seasons, linear regressions were calculated and sampling correlation coefficients were generated. Seasonal correlation coefficients obtained by comparing the PM2.5 FRM to the Big Meadows TEOM Continuous PM2.5 monitor are as follow:

Fall (September â November)  $R^2 = 0.9244$   $y = 0.975x + 1.3846$

Winter (December â February)  $R^2 = 0.7559$   $y = 1.1676x + 1.9691$

Spring (March â May)  $R^2 = 0.9161$   $y = 0.9661x + 1.9466$

Summer (June â August)  $R^2 = 0.9775$   $y = 1.035x + 2.1163$

$R^2$  is the determining factor of agreement between the data pairs. X is the uncorrected TEOM value and Y is seasonally corrected TEOM value resulting in "FRM-like" data.

<b>For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?</b> No	
<b>Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):</b> \$0	<b>Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):</b> \$2050
<b>List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:</b>  	

<b>Paperwork Reduction Act Statement:</b> A federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information is estimated to average 1.625 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural Resources (3127 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.
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